

Panel Placement in Landfill Design

0 Comments



When using geosynthetic materials to line a landfill cell or hazardous waste storage it is critical to consider panel placement, orientation, and joining or welding techniques to minimise risks of damage during placement of drainage aggregate or waste materials above the liners. Geosynthetic liners play a key role of protecting the surrounding environment and if these are installed incorrectly, or damaged during installation, then there is potential for leachate and landfill gas to escape into the environment. We have recently provided construction quality assurance services for a number of landfill lining jobs where these aspects were not fully considered.

When undertaking landfill liner or containment design there is a number of common steps that designers take to reach the end product, assessing types of materials to be contained, the natural geology and subgrade, the type of liner, use of geosynthetics and leachate collection system but often the practicality of constructing these items can be overlooked.

Here we will describe some of the issues that have arisen during a recent projects, although the landfill cells had been designed with current best practices in mind including composite liner made up of compacted clay (CCL), Geosynthetic Clay Liner (GCL), HDPE Geomembrane, protection geotextile and leachate collection system.

Irregular shaped cells

In CAD applications, the lining of irregular shaped cells seems straight forward and generally the designer leaves the panel placement up to the specialist liner contractor to determine. However, the designer may not consider site access and it can become difficult to install geosynthetic liners over compacted clay liners when access is difficult, causing installation issues, WH&S issues and risk of damage to the CCL, GCL and Geomembrane, and time delays. Another issue with irregular shaped cells is that it generally increases the number of welds and this can lead to an increased risk of weld failure. Generally where irregularly shaped geomembrane panels meet the requirement is to place a small piece of geomembrane over the intersection and extrusion weld it to the primary panels. These extrusion welds are not easily tested for integrity in the field and are generally considered not as strong as fusion welds. The more irregular the cell is the more likely that there will be a higher number of these extrusion welds, increasing the potential risk of escape of leachate and landfill gas in the completed cell. Therefore, the designer and client need to consider the impacts of irregular shaped cells and access requirements during design to ensure that the liners can be installed with minimal issues.

Connection to previously constructed cell liners

The connection of liners between previous cells and new cells needs careful consideration during design. Further, if the liner of the previous cell is not able to be accessed prior to construction, a risk assessment should be completed to identify and assess all of the potential hazards of uncovering, exposing and connecting to the existing liner. The uncovering and exposing of the liner can lead to the escape of leachate and landfill gas and also, depending on the method of uncovering and exposure, cause damage to the liner of the existing cell which may be extremely difficult to repair safely. The same issues need to be considered, during design, if the new cell is to connect to another cell in the future.

Leachate Pipe Trenches and Penetrations

Leachate pipe trenches and pipe penetrations through the geosynthetic liners can result in a higher number of geomembrane welds and reduce the integrity of the liner. Leachate trenches that are designed angular and have irregular shapes will require a higher number of welds including extrusion welds, which as described above, can reduce the integrity of the liner. Pipe penetrations are also another area that can reduce the integrity of the liner. Generally, a pipe boot is made out of the geomembrane using extrusion welds and placed over the pipe. Then a silicon based glue is placed between the pipe and the boot and then boot is then secured using stainless steel straps. Although a number of sealing measures are used about the pipe penetration, these penetrations are typically located in high risk areas within the leachate storage and can remain submerged for extended periods, further increasing the risk of leachate escape.

Geosynthetic Panel Placement

During construction it is critical to consider how the panels of geosynthetics are placed. Generally, GCL and geomembrane panel over laps should have the upslope panel overlap on top of the down slope panel, to ensure that leachate doesn't accumulate along the seams, which can increase the risk of leachate escape if the integrity of the welds are compromised. Further, the placement of protection geotextile on the geomembrane needs to be considered in relation to how the leachate drainage aggregate is going to be placed. Leachate aggregate should be placed onto the geotextile and not pushed, however, there is the risk of pieces of aggregate getting between the geotextile and the geomembrane if the overlaps aren't orientated in the direction of placement. It is critical that Project Managers, Superintendents and CQA Auditors/Consultants are aware of this aspect during the placement of leachate aggregate over the geosynthetic liners.